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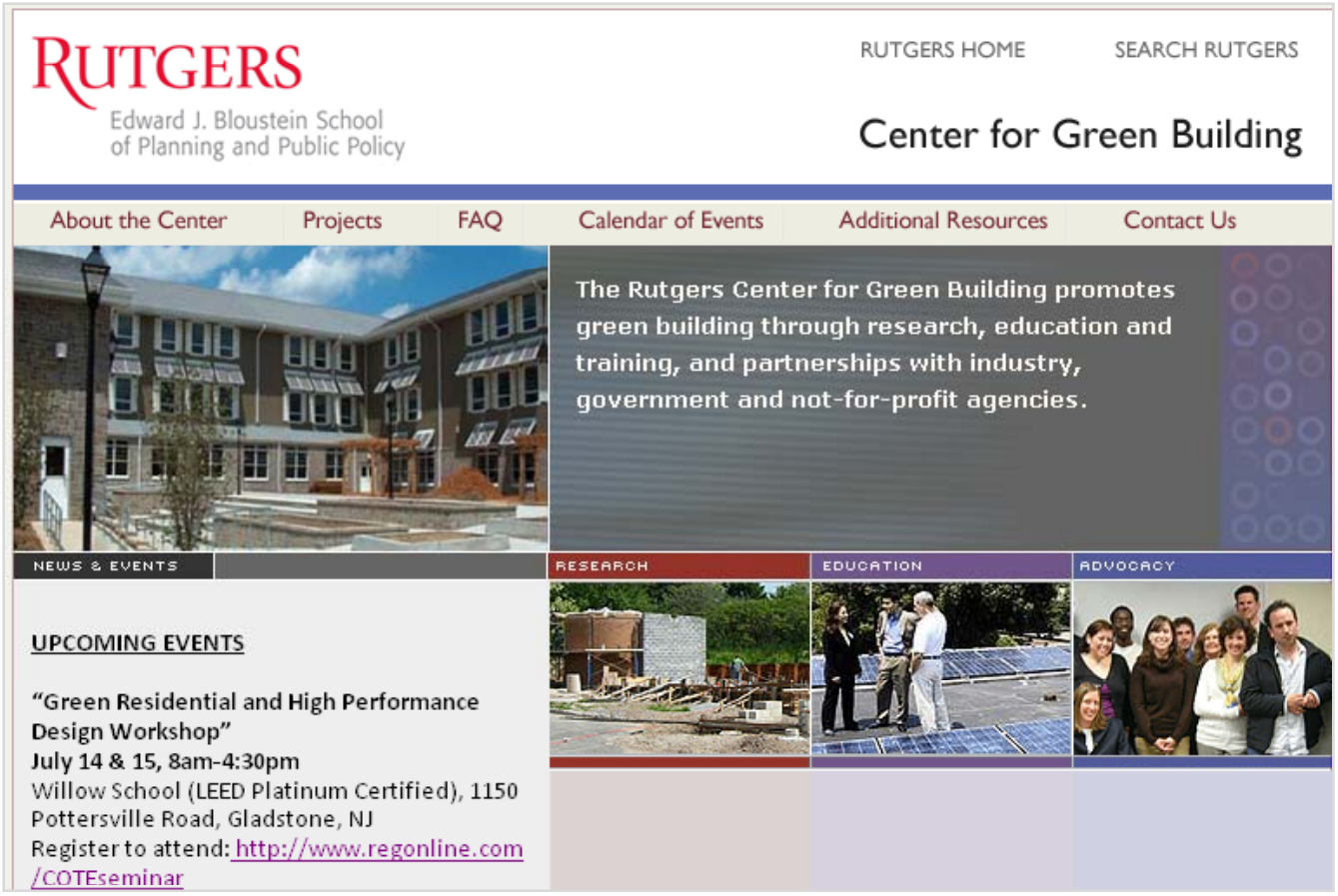
Edward J. Bloustein School
of Planning and Public Policy

Green Home Remodeling

Rutgers Center for Green Building

August 20, 2009

Rutgers Center for Green Building



- Research
- Education
- Advocacy

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Today's Presentation

Green Home Remodeling: Why is it important?

- Existing land use and development issues
- Looming climate change implications
- State energy and green house gas emission goals and policies

New Jersey Green Home Remodeling Guidelines Version 1.0

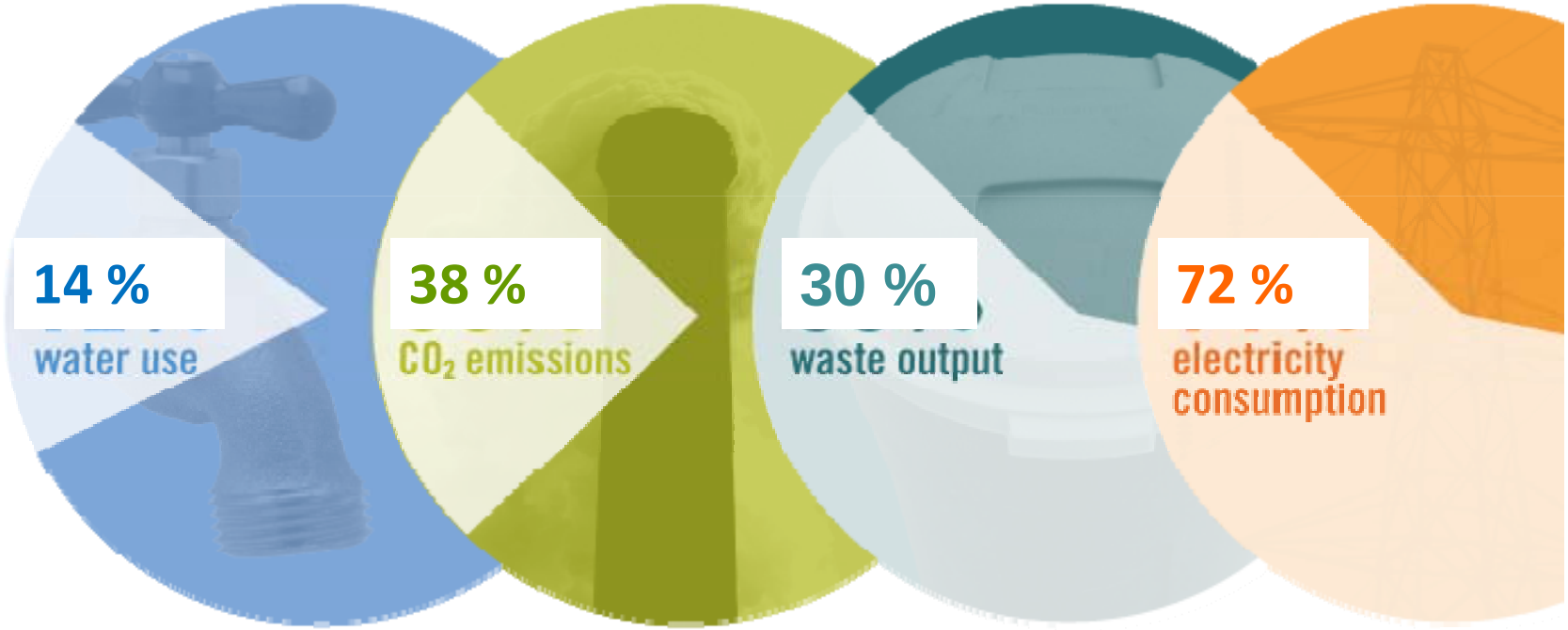
- Basis for the Guidelines
- How to Use the Guidelines

What can I do to 'green' my home?

- 10 Green Rules of Thumb

Green Home Remodeling:
Why is it Important?

Why Green Home Remodeling?



Source: U.S. Green Building Council

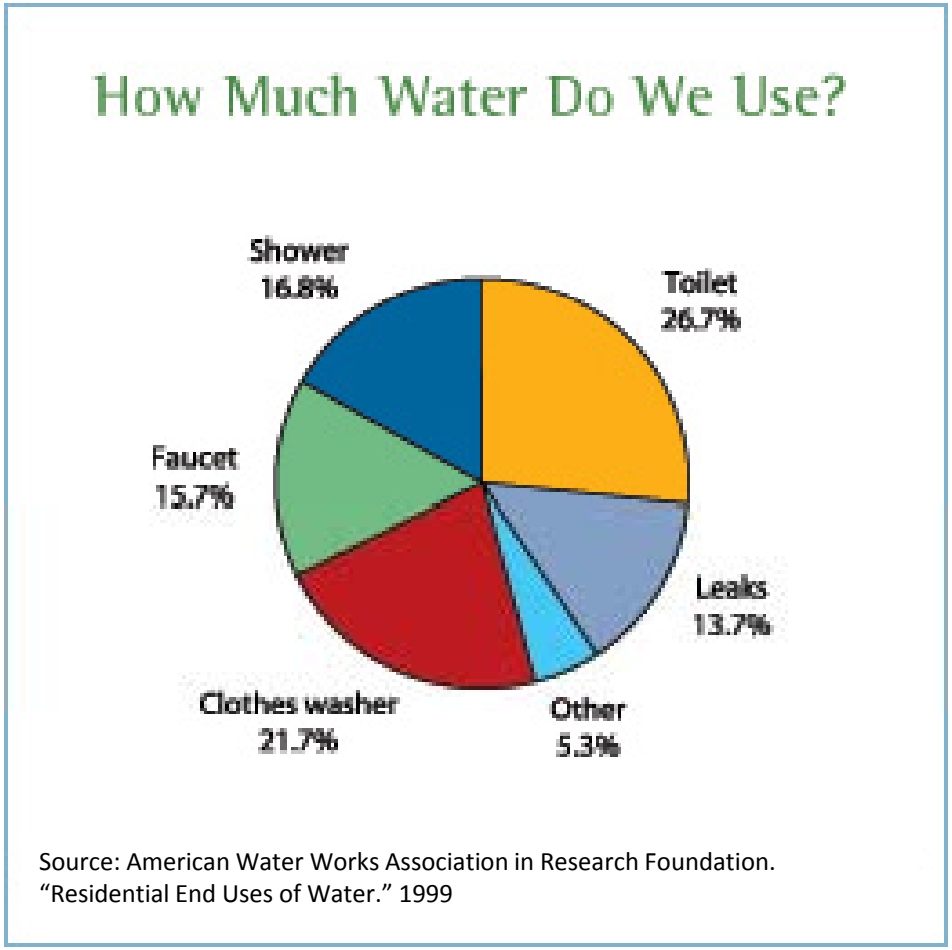
Why Green Home Remodeling?

- Average family of four uses 400 gallons of water each day.

- Average household spends as much as $500 per year on its water and sewer bill.

- Approximately 70 percent of that water is used indoors.

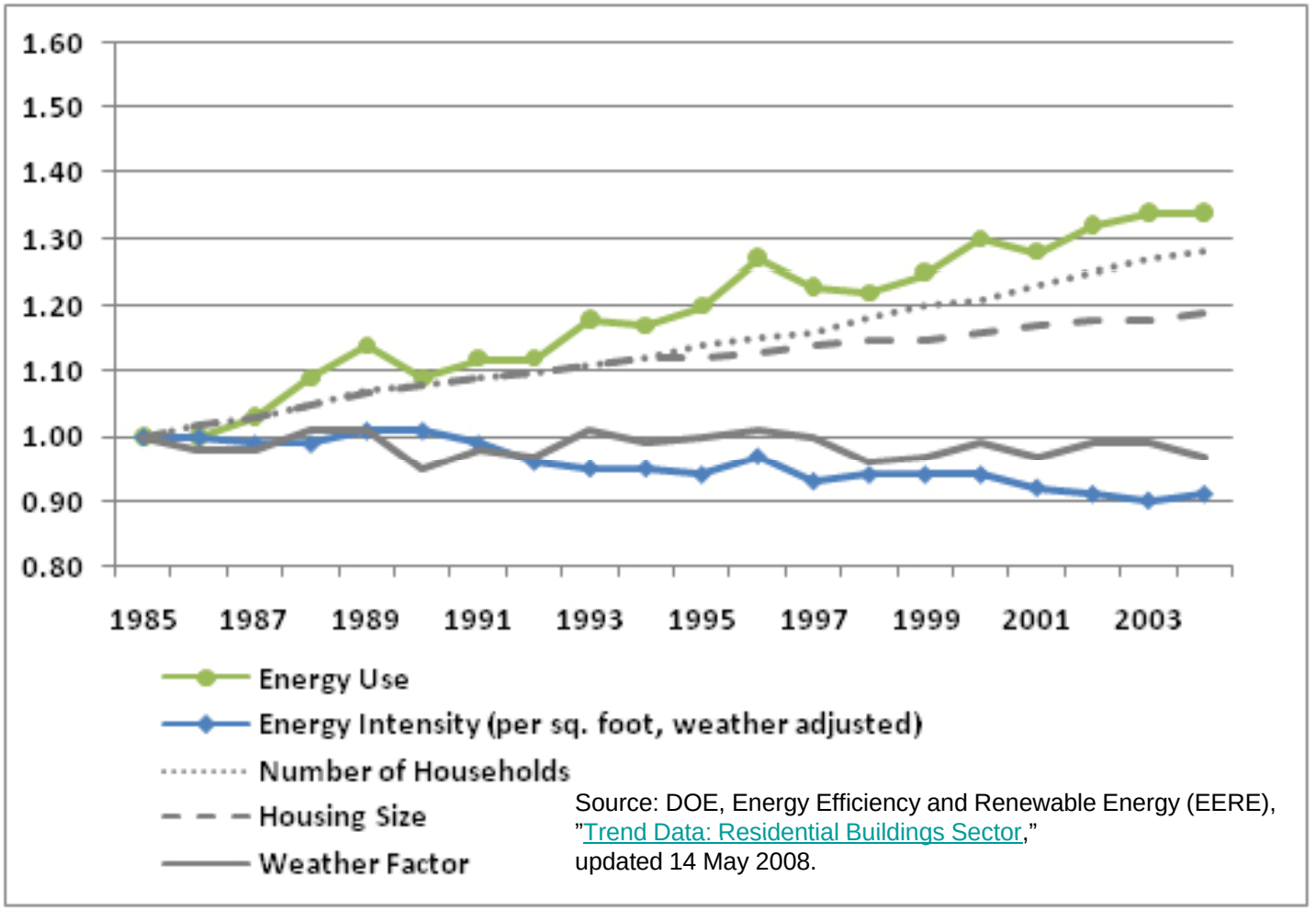
- The bathroom is the largest consumer of indoor water. The toilet alone can use 27 percent of household water.



Source: American Water Works Association in Research Foundation. "Residential End Uses of Water." 1999

Why Green Home Remodeling?

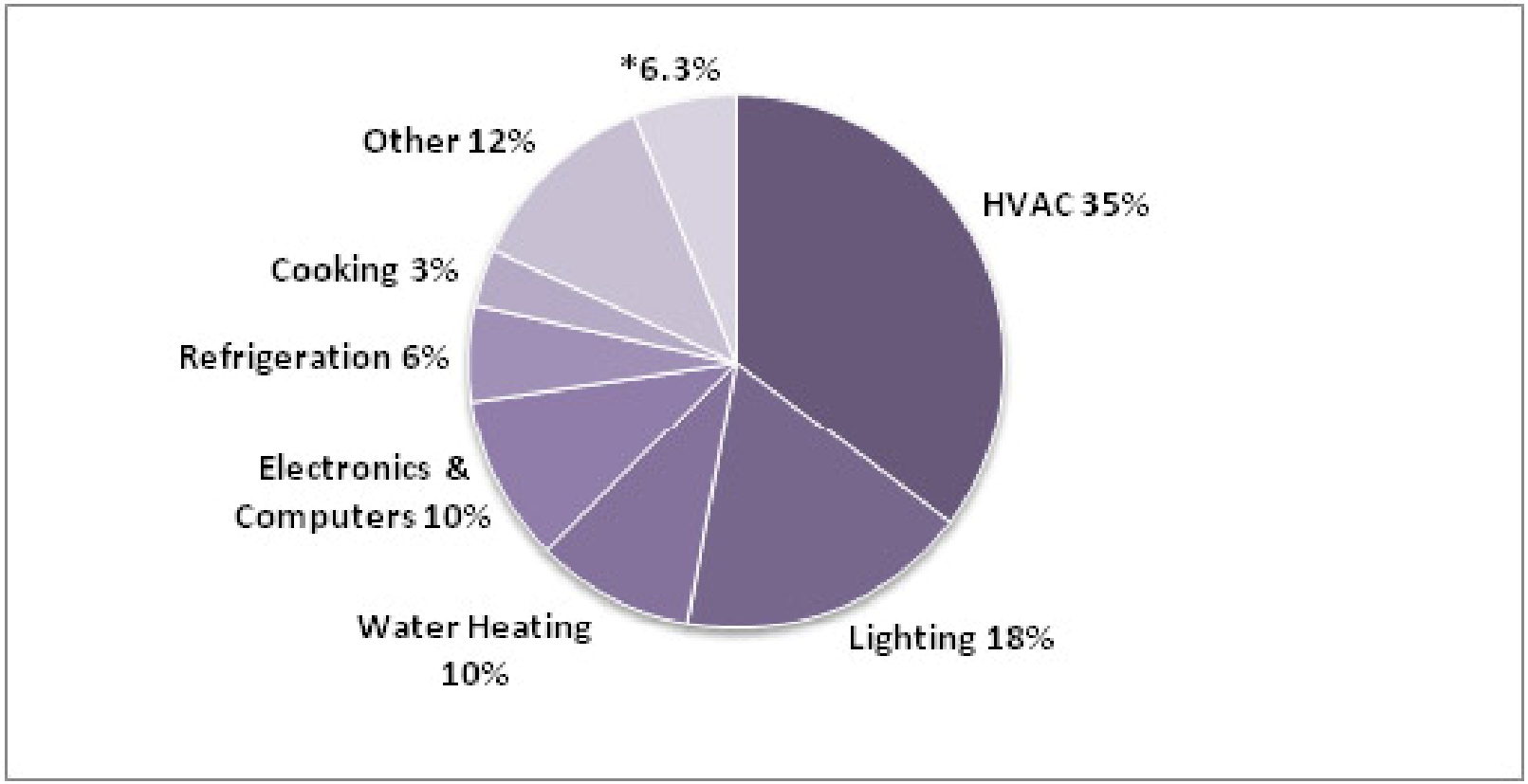
Residential Energy Use, Energy Use Intensity, and Energy Use Factors



Source: DOE, Energy Efficiency and Renewable Energy (EERE), "Trend Data: Residential Buildings Sector," updated 14 May 2008.

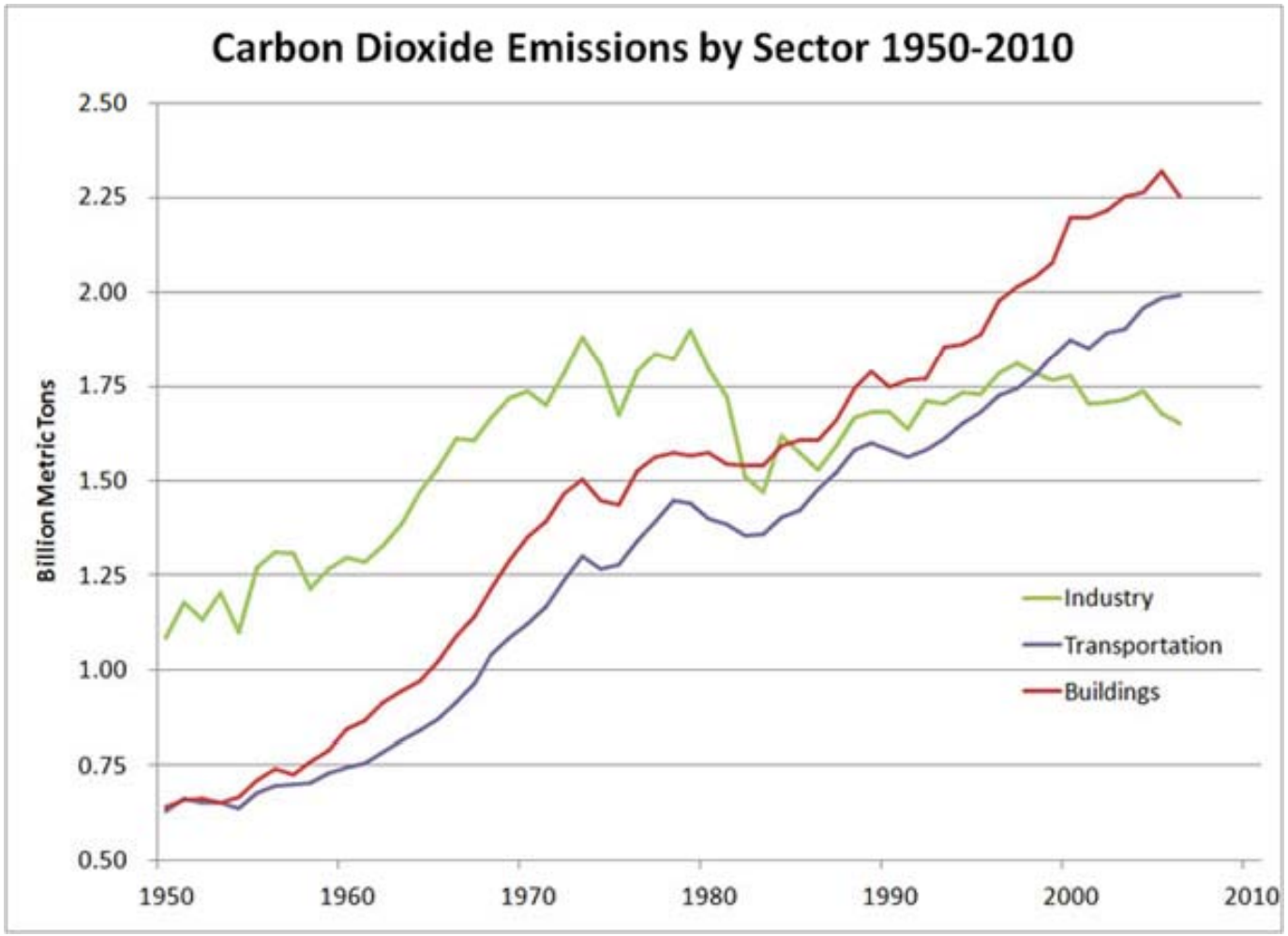
Why Green Home Remodeling?

Residential Buildings Total Energy End Use (2006)



Source: DOE, *2008 Buildings Energy Data Book*, Section 2.1.5, 2008.

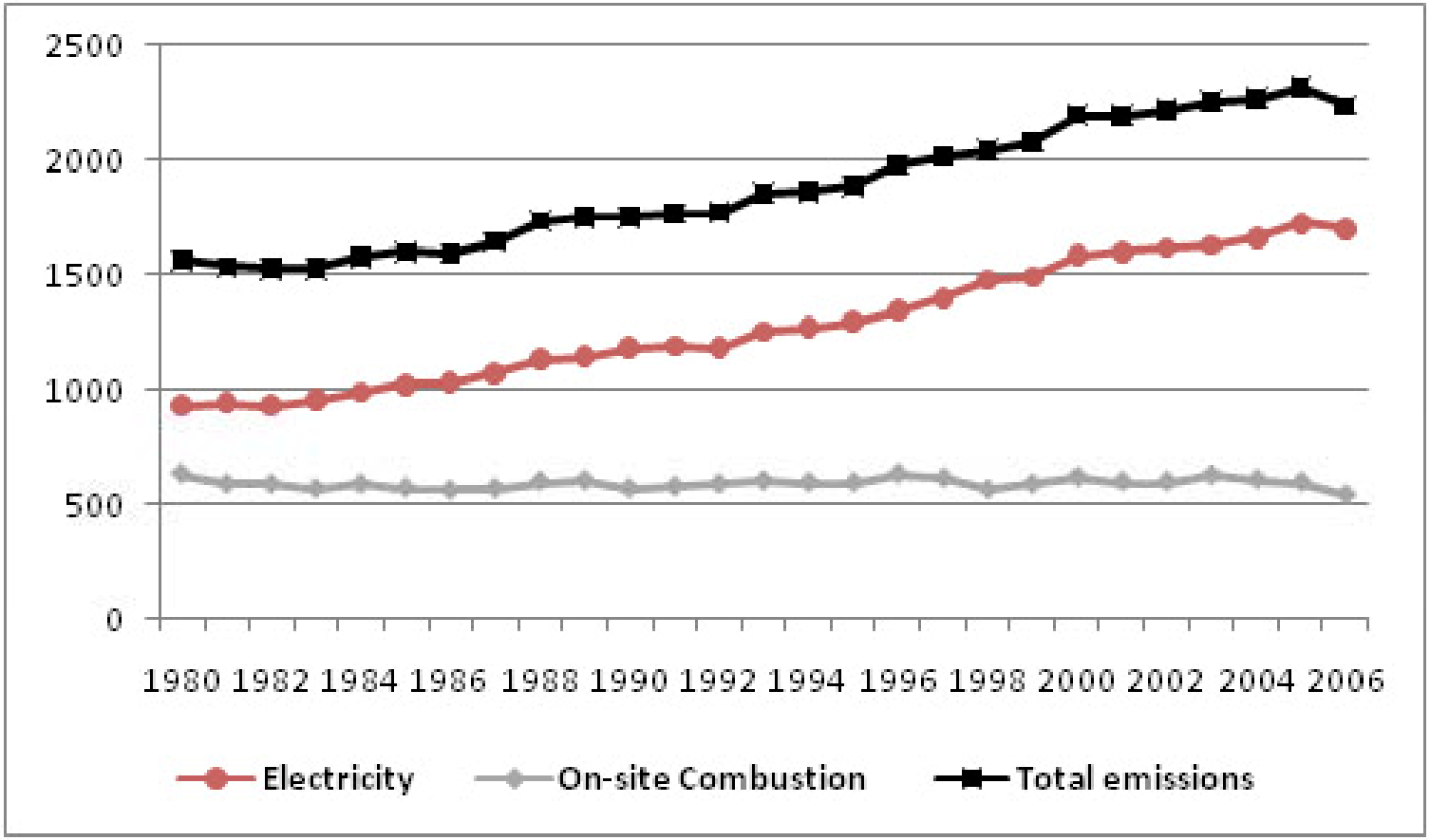
Why Green Home Remodeling?



Source: http://bet.rmi.org/rmi-news/the-revival-of-passive-design.html

Why Green Home Remodeling?

CO_2 Emissions for U.S. Residential and Commercial Buildings, by Year in Million Metric Tons (MMT)



Source: U.S. Department of Energy (DOE), *2008 Buildings Energy Data Book*, Section 1.4.1, 2008.

Why Green Home Remodeling?

Construction & Demolition (C&D) Waste

- According to the EPA, C&D waste accounts for 24% of all municipal solid waste.

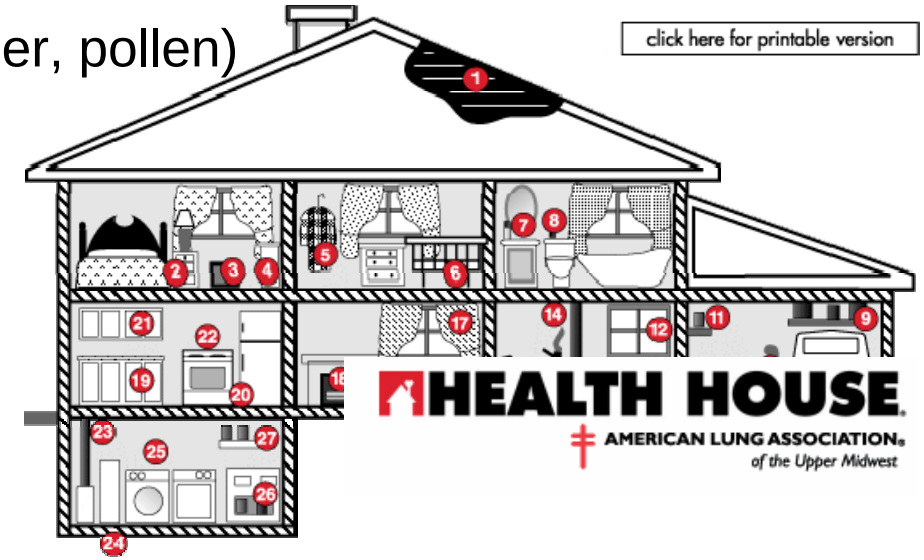
Source: U.S. EPA

- Residential remodeling projects generate 31.9 million tons per year of C&D waste in the US. (NAHB)
- As much as 95% of buildings-related construction waste is recyclable (DOE)

Why Green Home Remodeling?

Indoor Air Quality

- On average, Americans spend 90% of their time indoors, yet the air inside buildings can be 5-10 times more polluted than outdoor air, according to the U.S. Environmental Protection Agency.
- Most common pollutants are:
  - Radon
  - Combustion products
  - Biologicals (molds, pet dander, pollen)
  - VOCs
  - Lead dust and asbestos

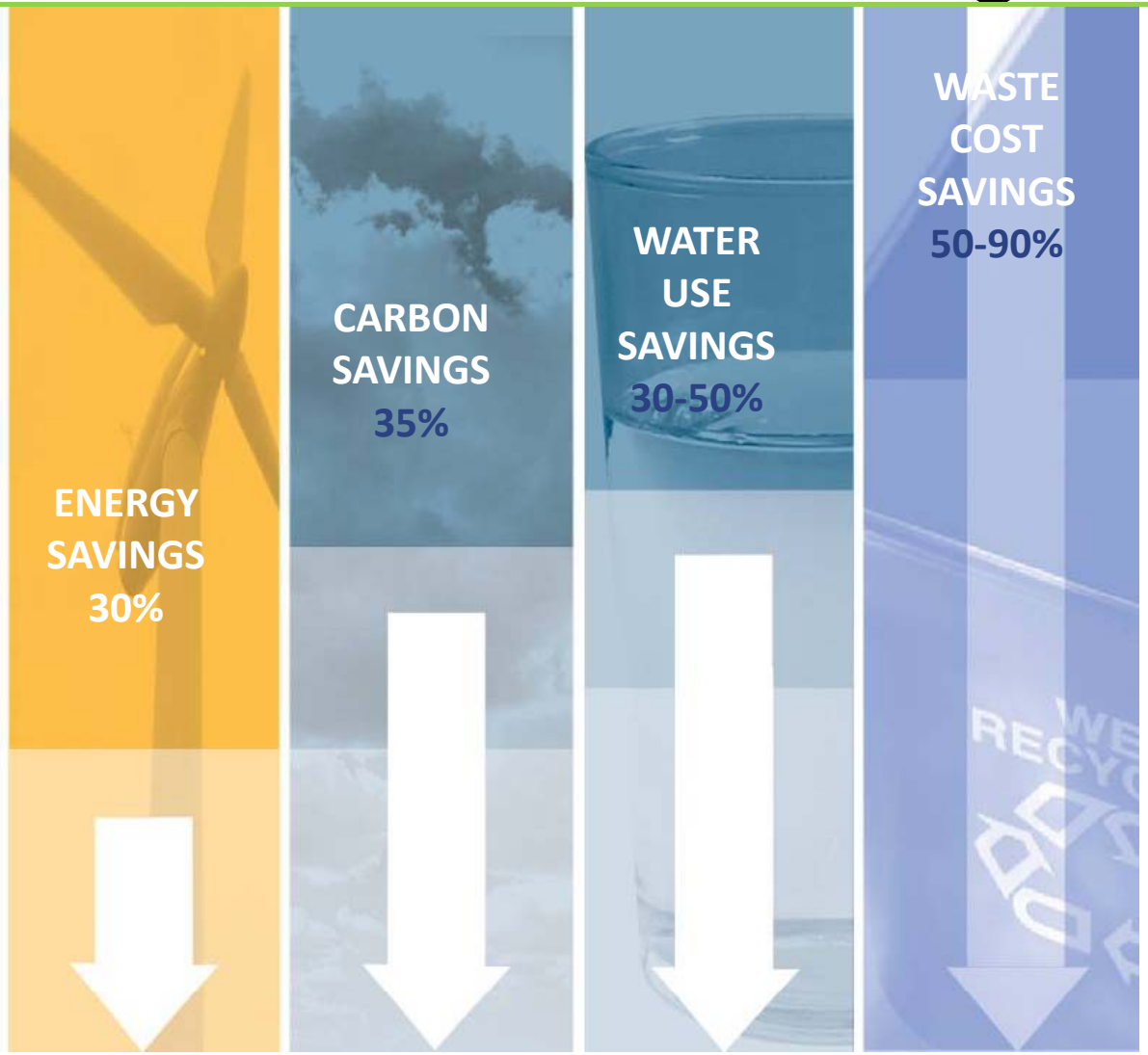


GREEN INDOOR ENVIRONMENTS
www.epa.gov/iaq/greenbuilding PROGRAM

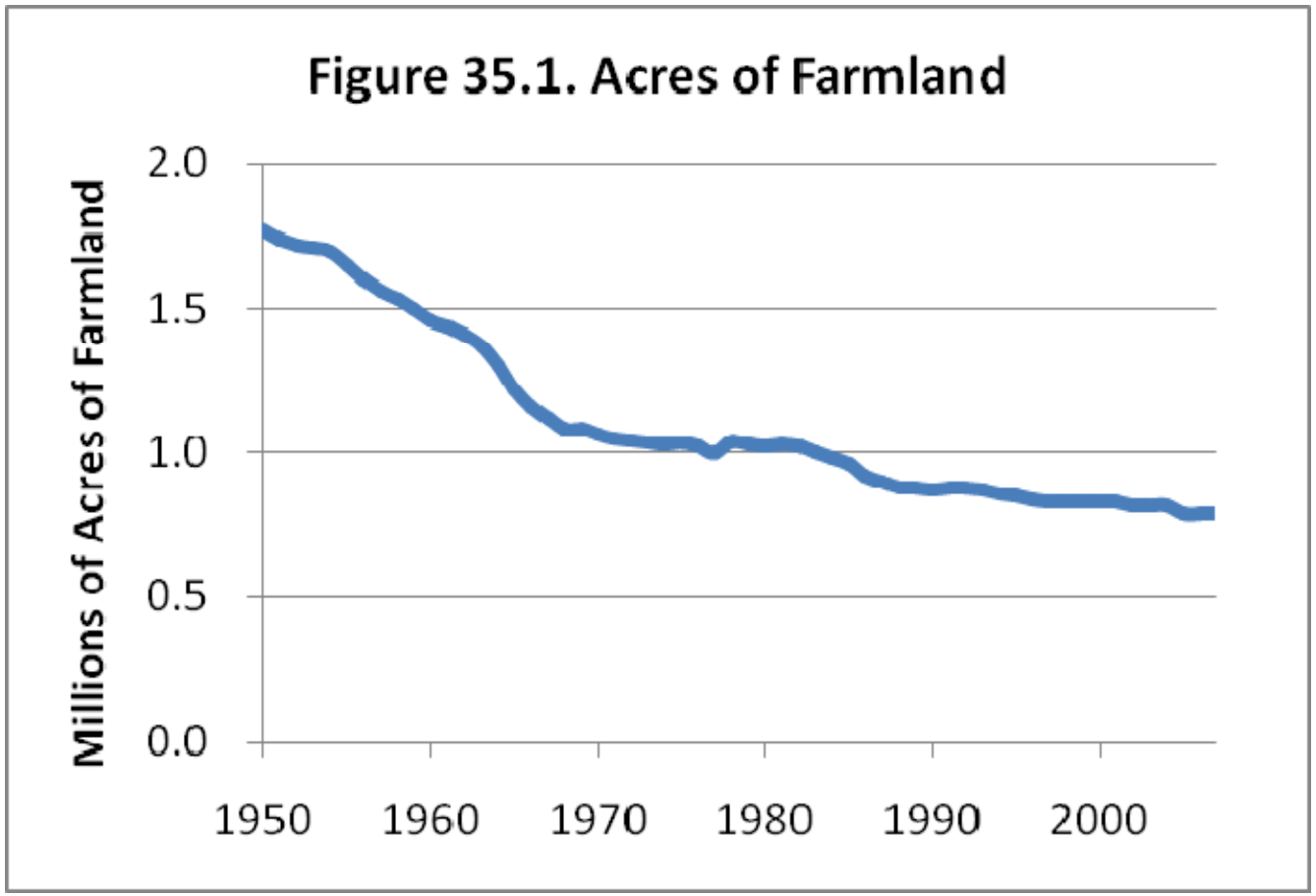
Source: http://www.epa.gov/iaq/greenbuilding/index.html

Why Green Home Remodeling?

Average Savings of Green Buildings



Why Green Remodeling in NJ?



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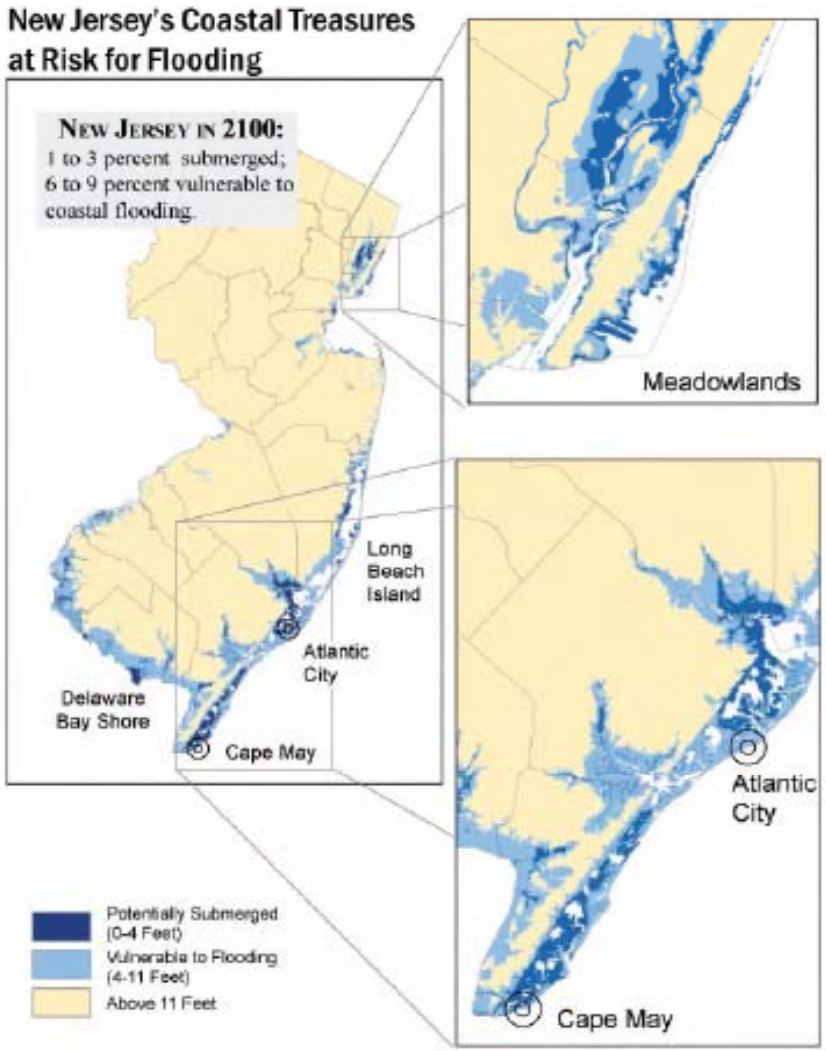
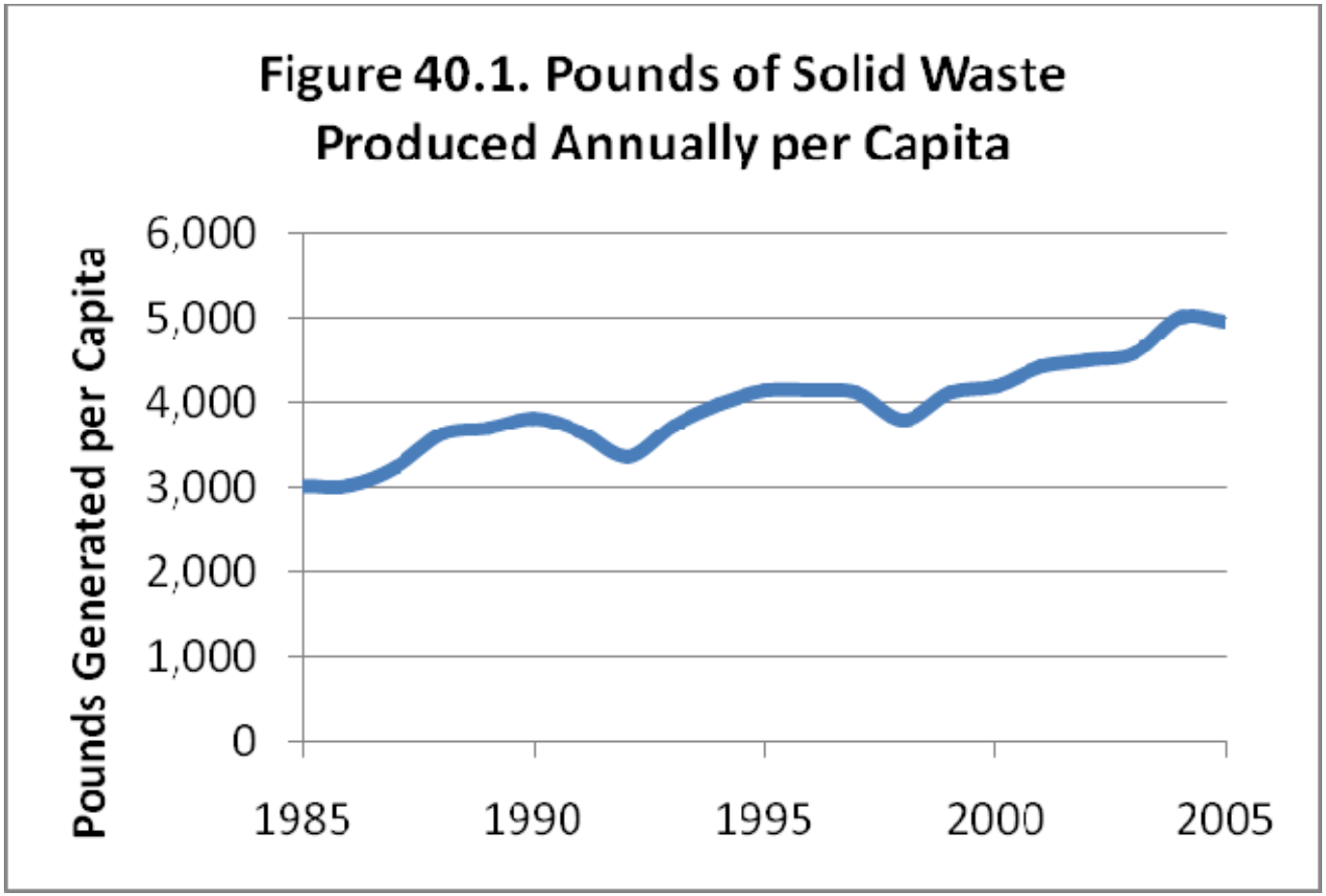
Why Green Remodeling in NJ?



Source: (left) Environment New Jersey. 2007. "Local impact of Climate Change in New Jersey"

Source: (right) Princeton University. 2007. The Garden State in the Green House: Climate Change Mitigation and Coastal Adaptation Strategies for NJ.

Why Green Remodeling in NJ?



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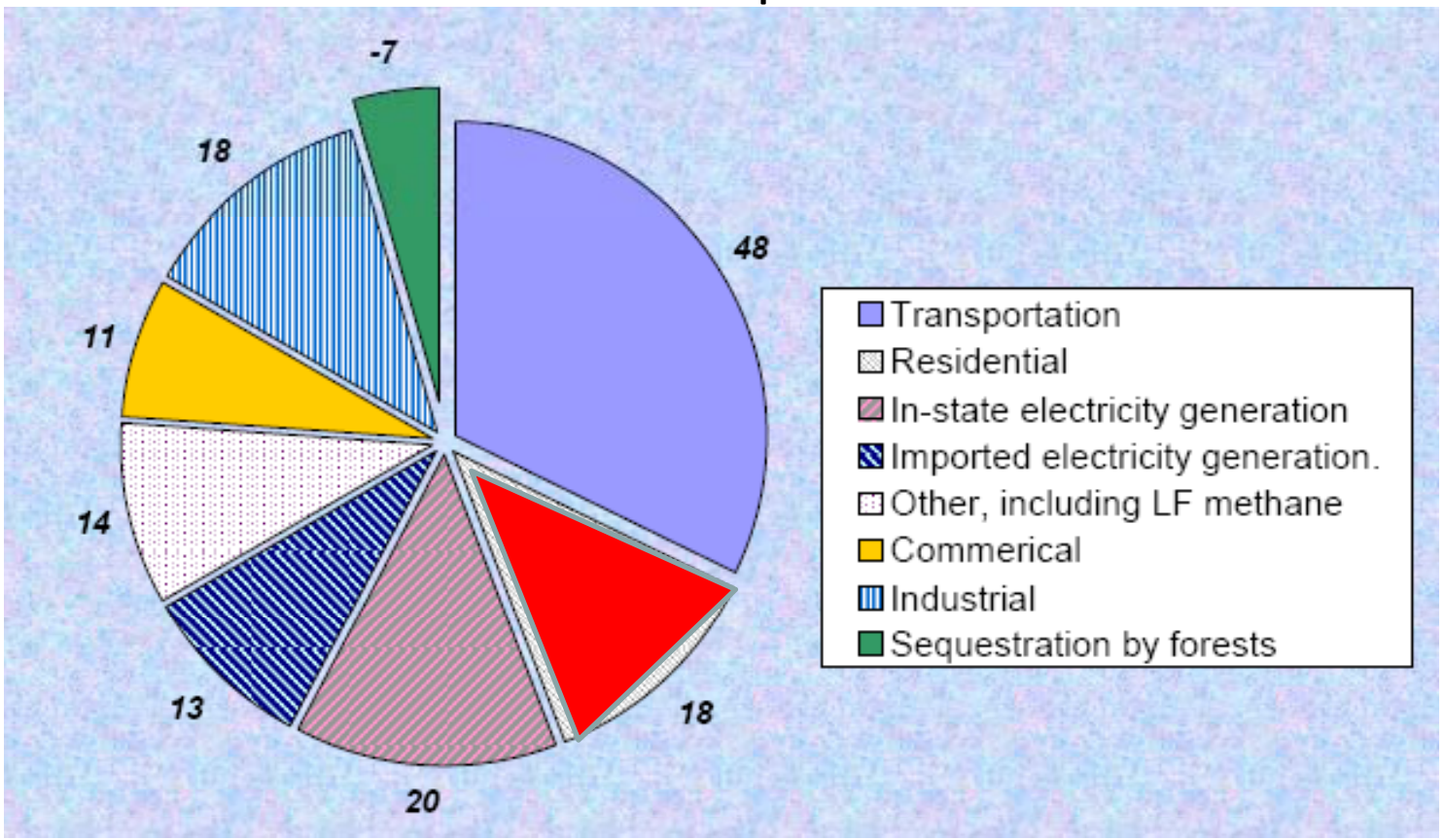
Why Green Remodeling in NJ?

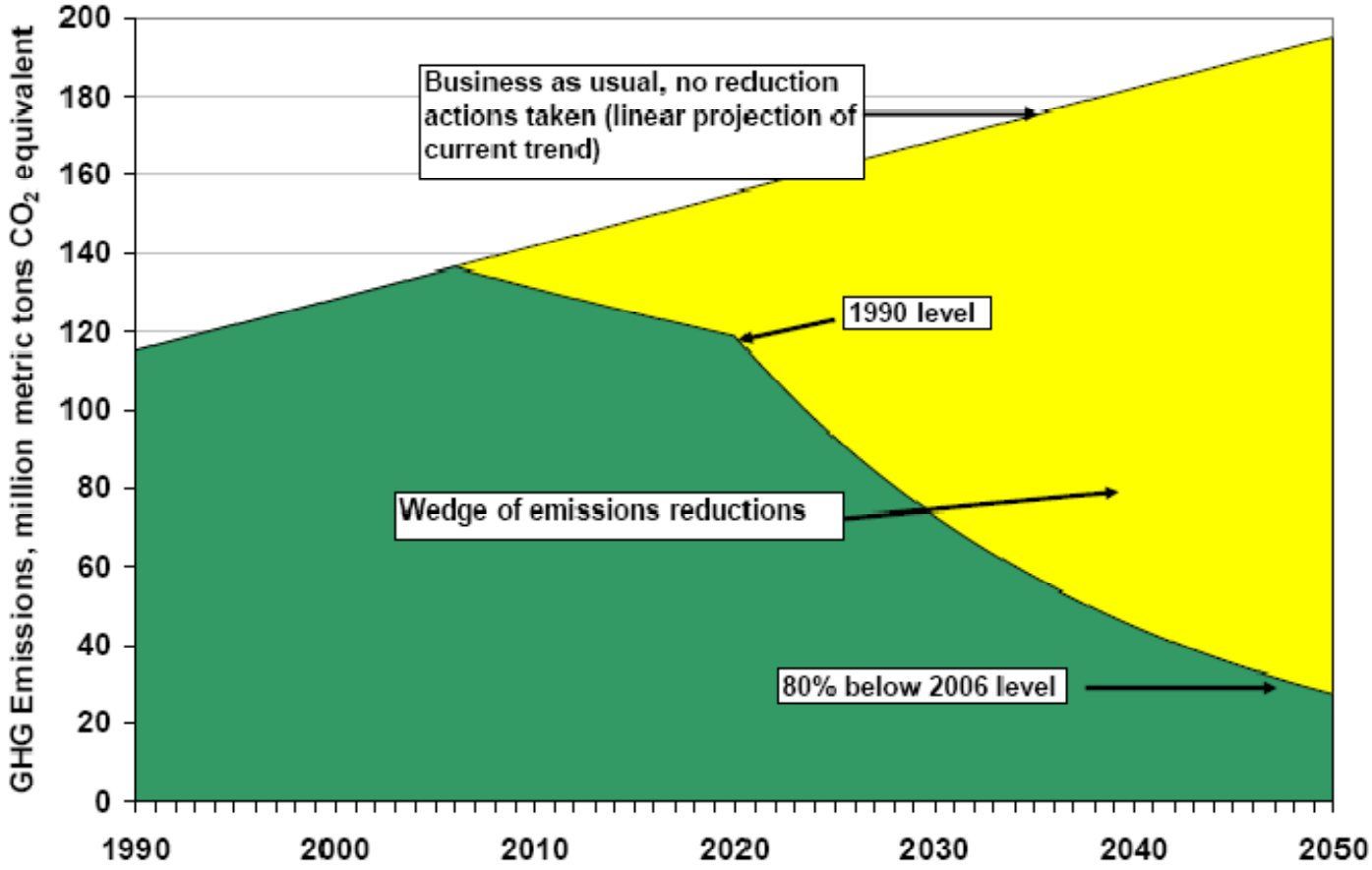
Greenhouse Gas Emissions by Sector; New Jersey, 2004
Millions of metric tons CO2 equivalent



Source: NJDEP draft Greenhouse Gas Plan. 2008.

Why Green Remodeling in NJ?

New Jersey Greenhouse Gas Emissions and Limits



NJDEP 2007

NJ Green Home Remodeling Guidelines Version 1.0

What is Green Home Remodeling?

- Sustainable site planning and connecting to nature
- Safeguarding water and water conservation
- Energy efficiency and renewable energy
- Conservation of materials and resources
- Indoor environmental quality and health
- Collaborative and integrated design
- Life-cycle costs and benefits





Best Practice Review

ENERGY STAR

REGREEN
ASID & USGBC

rated
PORTLAND'S GREEN BUILDING RESOURCE

Gb GREEN BUILT REMODELED home

mngreenstar

Build It Green
2007 Edition
HOME REMODELING
GREEN BUILDING GUIDELINES

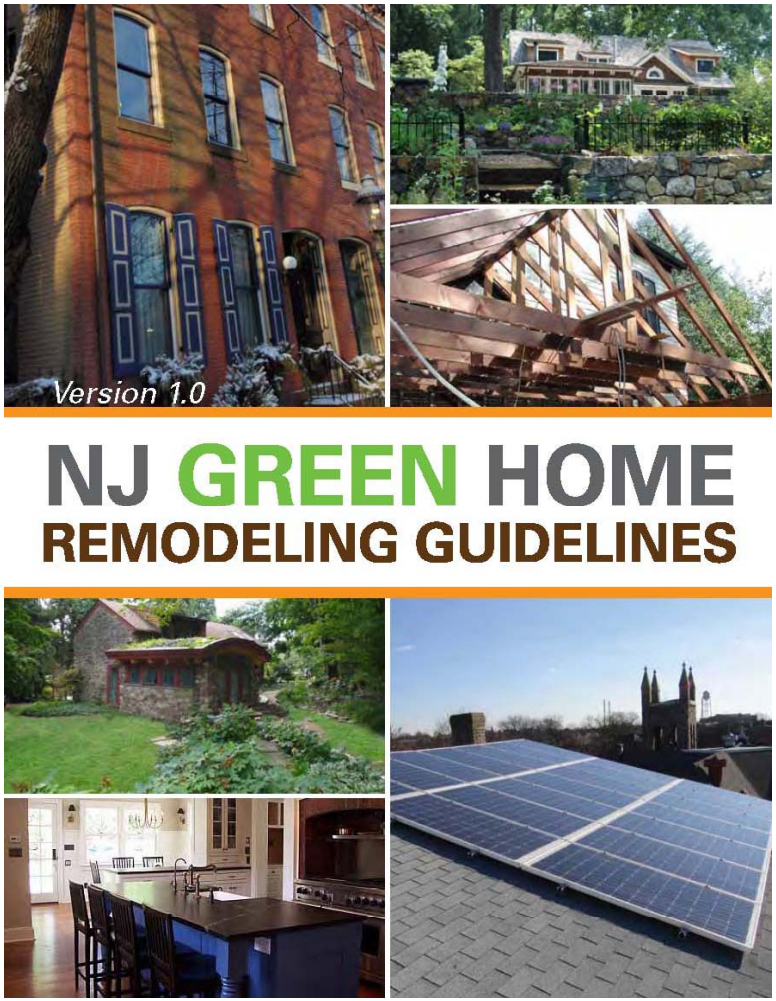
CITY OF BOULDER
City of Boulder
Residential Building Guide

NJ Green Remodeling Guidelines: Expert Advisory Group

Thomas G. Wells Construction

Environmental Safety and Management Corp.

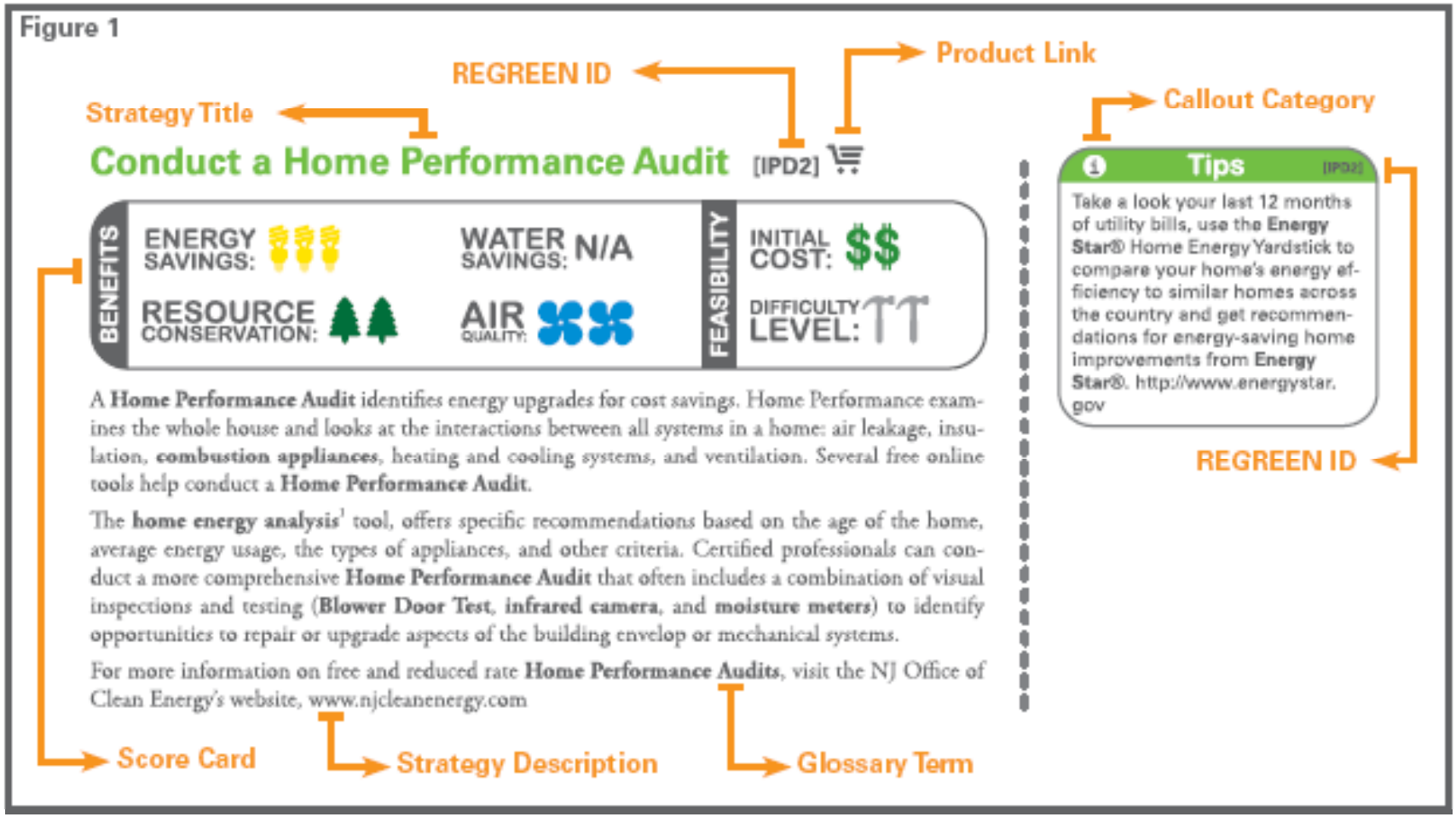
NJ Green Home Remodeling Guidelines



Project Sections:

- Kitchen, Bath & Living Spaces
- Finished Basement & Major Addition
- Weatherization & Energy
- Outdoor Living & Landscaping

Sample Strategy Write-up



Sample Scorecard

Conduct a Home Performance Audit [IPD2]

BENEFIT Key

1 icon = low benefit; 2 icons = medium benefit; 3 icons = high benefit

FEASIBILITY Key

$ = low initial cost; $$ = medium initial cost; $$$ = high initial cost

T = low difficulty level; TT = medium difficult level; TTT = high difficulty

Health and Safety Guide

HS1 – Nuisance and Toxic Dust Control HS1

HS2 – Hazardous Materials - Asbestos & Lead HS2

HS3 – Mold HS3

HS4 – Radon HS4

Upgrade or replace existing windows HS2 [EA56/59]

BENEFITS

ENERGY SAVINGS:

WATER SAVINGS:

RESOURCE CONSERVATION:

AIR QUALITY: N/A

FEASIBILITY

INITIAL COST: $$$

DIFFICULTY LEVEL:

Caution [EA56/59]

Be careful of lead based paints and enamels on older windows, trims, and sashes.

Case Studies

Case Study

Location of Project: Bernardsville, New Jersey
Submitted by: Michael Fleischacker, CLA, ASLA, LEED AP
Landscape Architect: Michael Fleischacker
General Contractor: Back to Nature

- Overview and Scope
- Design Approach
- Team and Process
- Finance
- Lessons and Tradeoffs
- List of Green Strategies

Sample Green Product Page

Kitchen Bath and Living Spaces

Building Envelope

Product	Features	Certifications	Product Directory/Service Resources	REGREEN ID
Windows	Look for windows with a high R-Value or low U-factor, and a low air leakage value.		National Fenestration Rating Council - Product Directory http://cpd.nfrc.org/search/searchdefault.aspx Energy Star® - Windows, Doors, Skylights - http://www.energystar.gov/index.cfm?c=windows_doors.pr_windows Creating Windows of Energy-Saving-Opportunity www.homeenergy.org/archive/hem.dis.anl.gov/eehem/97/970908.html Efficient Windows Collaborative www.efficientwindows.org/	EA56-59
Doors	Look for doors with a high R-Value or low U-factor, and Low Air Leakage Value.		National Fenestration Rating Council - Product Directory http://cpd.nfrc.org/search/searchdefault.aspx Energy Star® - Windows, Doors, Skylights - http://www.energystar.gov/index.cfm?c=windows_doors.pr_windows Creating Windows of Energy-Saving-Opportunity www.homeenergy.org/archive/hem.dis.anl.gov/eehem/97/970908.html Efficient Windows Collaborative www.efficientwindows.org/	EA56-59
Skylights	Look for skylights with a high R-Value or low U-factor, and Low Air Leakage Value.		National Fenestration Rating Council - Product Directory http://cpd.nfrc.org/search/searchdefault.aspx Energy Star® - Windows, Doors, Skylights - http://www.energystar.gov/index.cfm?c=windows_doors.pr_windows Creating Windows of Energy-Saving-Opportunity www.homeenergy.org/archive/hem.dis.anl.gov/eehem/97/970908.html Efficient Windows Collaborative www.efficientwindows.org/	EA56-59

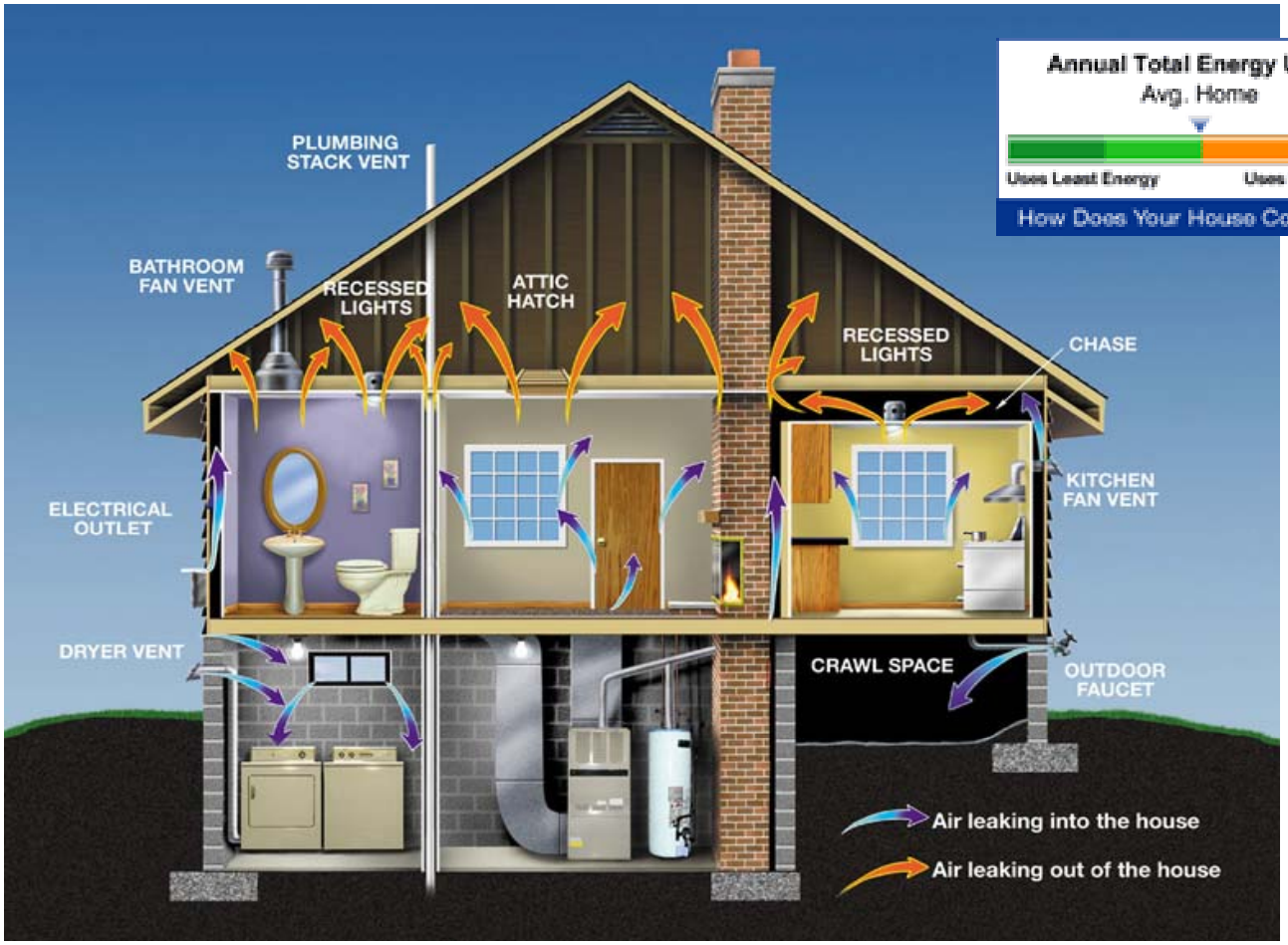
What can I do to ‘green’ my home?

10 Green Rules of Thumb

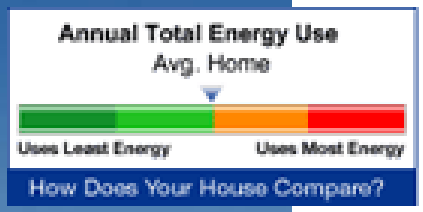
1. Identify low hanging fruit
2. Expand your definition of cost
3. Choose energy-efficient appliances
4. Find incentives and tax credits
5. Conserve water
6. Reduce, reuse, recycle
7. Improve indoor air quality
8. Landscape for biodiversity
9. Shop for green labels
10. Learn more

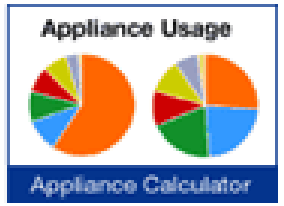
1. Identify low hanging fruit

Perform a home energy analysis



Source: http://www.chrisstewart.ca/images





Source: njcleanenergy.com/

- Identify opportunities for saving energy
- Check with local utility providers for energy audit programs & tools

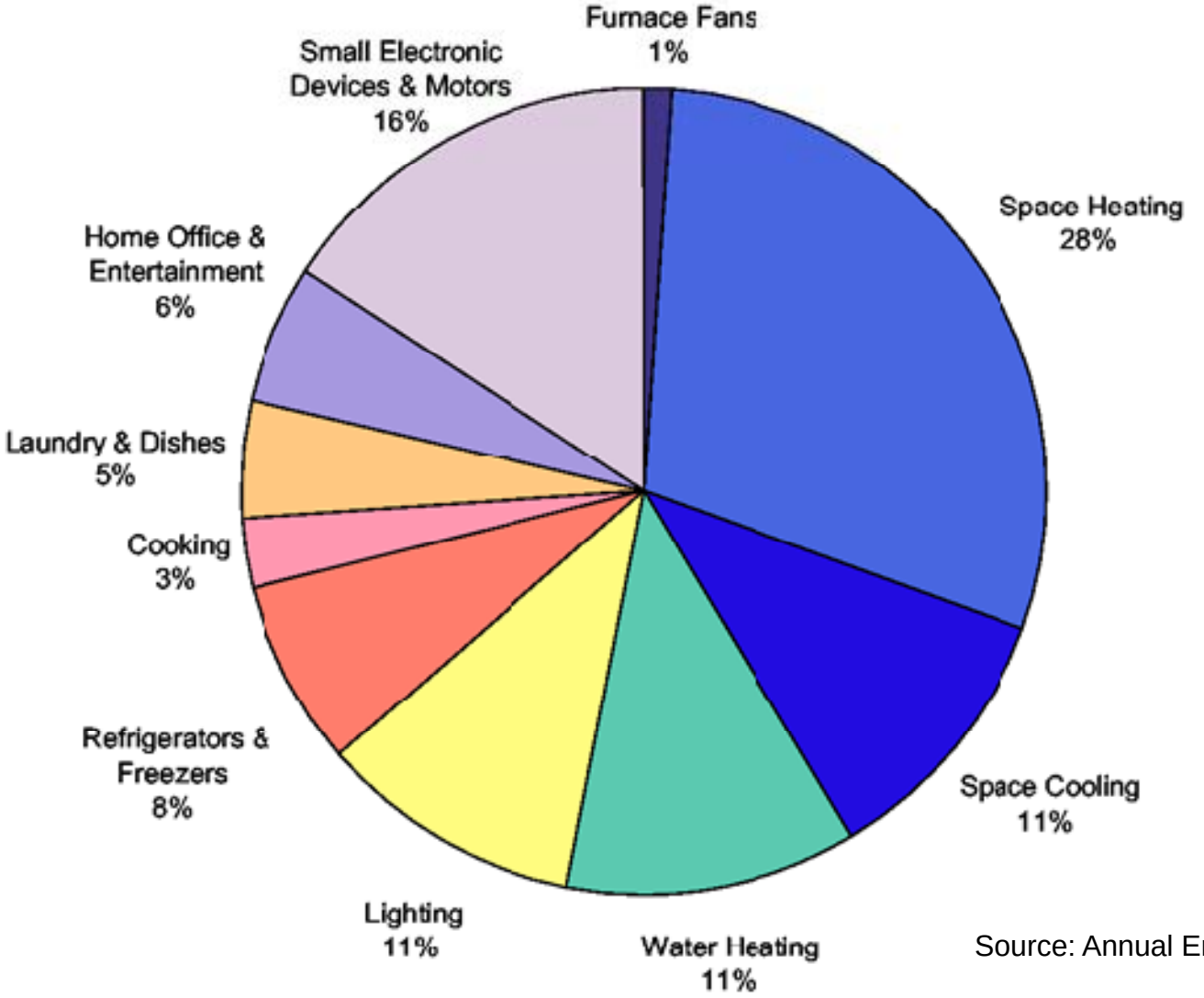
Use a free online home energy analysis tool

The NJ Clean Energy Program offers a free online energy analysis tool. Find out:

- Which appliances use the most energy.
- Where your home energy usage stands versus other homes in New Jersey.
- Specific recommendations for saving energy.

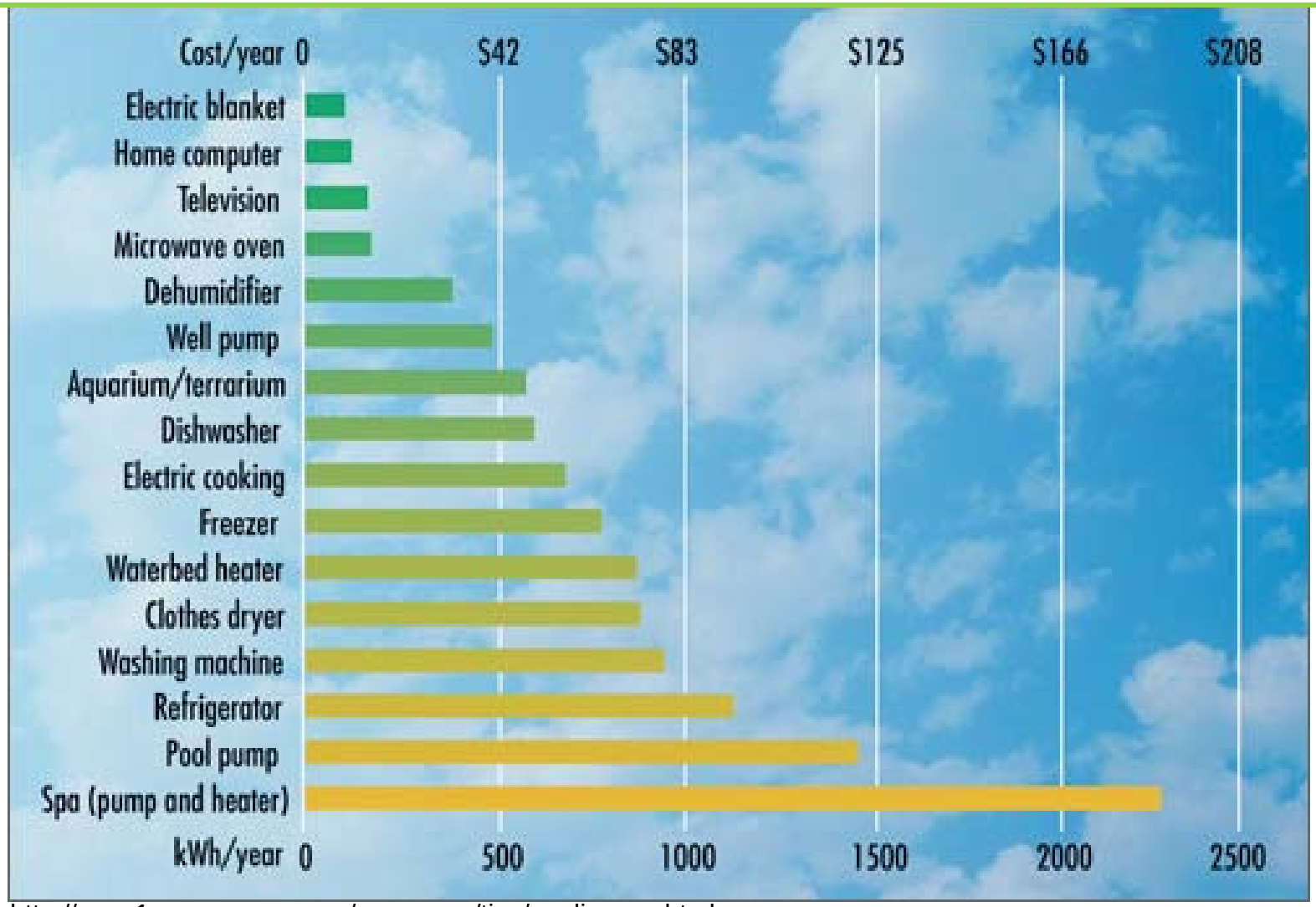
Check out: www.njcleanenergy.com

What are the home's biggest energy users?



Source: Annual Energy Outlook, 2007

How much electricity do appliances use?



http://www1.eere.energy.gov/consumer/tips/appliances.html

Free things that cost nothing and save cash

- Turn down water heater thermostat to 120°F.

- Turn off lights and computers; unplug appliances when not in use.

- Set thermostats to 68°F in winter when you're home, and down to 55°F when you go to bed or when you're away.

- Clean your refrigerator's condenser coils once or twice a year.

- Repair leaky faucets and toilets (5 percent of water "use" is leakage).

- Close drapes (and windows) during sunny summer days and after sunset in the winter.

Source: Rocky Mountain Institute

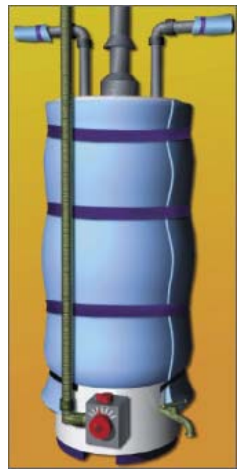
Simple and inexpensive things that will pay for themselves in lower energy bills in less than a year

- Install a water-saving 2.5-gallon-per-minute showerhead ($15).

- Install water-efficient faucet aerators for your kitchen and bathroom sinks ($2 each).

- Install a programmable thermostat ($26)

- Clean or change the air filter (at least every 3 months) on your heating system during winter and on air conditioning units in the summer ($2).



- Wrap the water heater ($12). Insulate the first three feet of hot and cold water pipes ($6).

- Install a compact fluorescent light bulb in the fixture you use the most ($15).

Source: Rocky Mountain Institute

Measures that collectively will cost up to $500 and have paybacks of one to three years

- Get a comprehensive energy audit, including a blower door test, to identify sources of air infiltration.

- Caulk and weatherize all leaks identified by the test. Start with the attic and basement first, then weatherize windows and doors.

- Have heating and cooling systems tuned up every year or two.

- Add insulating shades to windows, or add insulating storm windows.

- Insulate hot water pipes in unheated basements or crawlspaces.

Source: Rocky Mountain Institute

Hire a professional home performance auditor

The Home Performance with ENERGY STAR Program is offering assessments to NJ homeowners for just $250* (a $500 value).

- Heating and cooling equipment
- Insulation Levels
- Air leakage
- Windows and doors
- Appliances and lighting

Measures that will save a lot of energy and money

- Add or upgrade insulation in the attic.

- Replace outside lights with cfls or solar lights and put them on a timer or motion sensor.

- Upgrade your water heater, furnace, boiler, air conditioners, and refrigerator to more efficient models.

- Upgrade to low-emissivity windows if replacement is needed.

- Replace old toilets with high-efficiency models that use 50–80 percent less water.

- Install awnings or build removable trellises over windows that overheat your home in the summer.

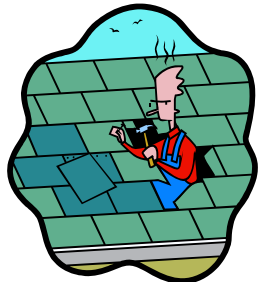
Source: Rocky Mountain Institute

2. Expand your definition of cost

What does it cost?

- **Initial costs:**
  - Actual cost of the material or product – what you pay once to buy the material or product and install it in your home.

- **Maintenance costs:**
  - The costs associated with maintaining the house.



- **Payback period:**
  - The period of time is takes to recover the cost of a green investment.

Total cost
(including purchase
price and installation)
---------- = **payback period in years**
Expected annual savings

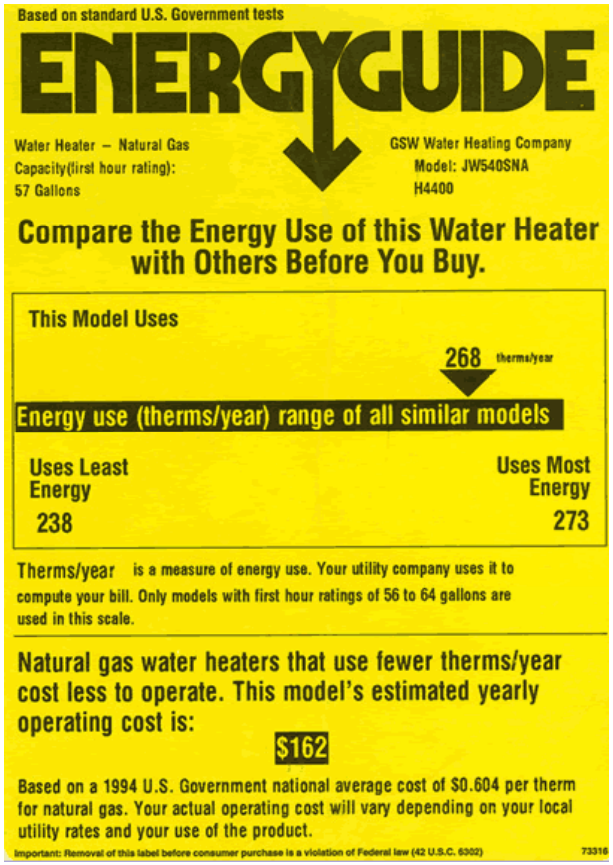
3. Choose Energy Efficient Appliances

Choose energy efficient appliances

- According to the EPA, appliance use comprises about 18% of a typical home's total energy bill.

- EPA suggests replacing appliances (10 years old) with energy-efficient models that bear the Energy Star or Energy Guide logo.

ENERGY STAR


Based on standard U.S. Government tests

ENERGYGUIDE

Water Heater – Natural Gas
Capacity(first hour rating):
57 Gallons

GSW Water Heating Company
Model: JW540SNA
H4400

Compare the Energy Use of this Water Heater with Others Before You Buy.

This Model Uses

268 therms/year

Energy use (therms/year) range of all similar models

Uses Least Energy
238

Uses Most Energy
273

Therms/year is a measure of energy use. Your utility company uses it to compute your bill. Only models with first hour ratings of 56 to 64 gallons are used in this scale.

Natural gas water heaters that use fewer therms/year cost less to operate. This model's estimated yearly operating cost is:

$162

Based on a 1994 U.S. Government national average cost of $0.604 per therm for natural gas. Your actual operating cost will vary depending on your local utility rates and your use of the product.

Important: Removal of this label before consumer purchase is a violation of Federal law (42 U.S.C. 6302) 73316

Energy saving purchasing tips

Refrigerators

- A new efficient refrigerator uses 50% less energy than one made 15 years ago.

- Side-by-side models are less space efficient and cost about $10-15 more to run than the top or bottom-freezers.

15-Year Old Refrigerator vs. New Bottom-Freezer

kWh/year: 1,165
Annual cost: $126

kWh/year: 505
Annual cost: $54

Source: Consumer Report October 2008

Energy saving purchasing tips

Clothes Washers

- Front-loaders use less energy and water, are usually gentler on clothes, and have faster spin speeds that wring more water out of laundry than regular top-loaders do.

- Replacing a pre-1994 washer with an Energy Star model can save a family $110 a year on utility bills.

Source: Consumer Report October 2008

Top-Loader vs. Front-Loader

Gallons water/year: 10,595
Annual cost: $277 (electricity and water)

Gallons water/year: 7,454
Annual cost: $148 (electricity and water)

Energy saving purchasing tips

Dishwashers

- Sophisticated sensors, high-efficiency pumps, and improved filtrations allow today's dishwashers to us as little as 3 gallons of water.

- Despite long pay-back periods, it makes sense to replace rather than repair a dishwasher that is 6 years old.

7-Year Old Dishwasher vs. New Dishwasher

Gallons hot water/year: 3,487 **Annual cost:** $118 (electricity and water)	**Gallons hot water/year:** 1,517 **Annual cost:** $67 (electricity and water)

Source: Consumer Report October 2008

Energy saving purchasing tips

Home Electronics

- Plasma TVs typically use more energy than LCDs

•Unplug the TV when it is not in use. A quarter of the energy used by your TV each year is consumed when the TV is off or in standby mode.

50-inch Plasma vs. 52-inch LCD

kWh/year: 1.159	**kWh/year:** 667
Annual cost: $125	**Annual cost:** $72

Source: Consumer Report October 2008

4. Look for incentives and tax breaks

Energy Star Appliance Rebates

NJ Clean Energy Program

- Receive a $25 Rebate on ENERGY STAR dehumidifiers.

- Receive $50 or $75 Mail-in Rebate on select Energy Star Qualified Clothes Washers.

- Check out: www.njcleanenergy.com

Federal Tax Credits 2009

Purchase	Tax savings	Notes
Central air conditioner or heat pump	**$300***	**Only some Energy Star products qualify.**
Furnace or boiler	**$150***	**Only some Energy Star products qualify.**
Skylights and Storm Windows	**Up to $200***	**All Energy Star windows qualify.**
Insulation and sealing	**Up to $500***	**Must meet model building code as installed.**
Ground-source heat pump	**Up to $2,000**	**Only Energy Star products qualify.**

- *Maximum of $500 total for home improvements made during 2006, 2007, or 2009.*
- *Note: tax credits not available for improvement s made during 2008.*

Source: Alliance to Save Energy

5. Conserve water

Install low-flow fixtures

- Look for WaterSense label = water efficient fixtures.

- Faucets must have a max flow rate of 1.5 gpm = 20% below old standard 2.2 gpm.

- Older toilets (before 1992) use 3.5-7 gallons of water per flush as opposed to new high efficiency toilets that only use 1.3 gallons per flush.

- Conventional showerhead uses 12 gallons per minute as opposed to low flow models that use 3 gallons per minute.

Xeriscape. Use drip irrigation/rain barrels

- Average household uses 30% of their water outdoors for irrigation.

- Use plants that need little water – *Xericaping*

- Drip irrigation systems use between 20-50% less water then conventional in-ground sprinkler systems.

- Rain-barrels collect rainwater and reduce the amount of potable water used in your garden.

- Watering early in the morning is best

Image: www.aestheticearthworks.com

6. Reduce, Reuse, Recycle

Reduce yard and kitchen waste

- Over 34 million tons of yard waste (grass, leaves, branches, etc.) are generated annually.

- Grasscycle – leave grass clippings on the lawns when you mow.

- Chip woody waste and tree clippings into mulch for use on-site

- Compost leaves and kitchen fruit and vegetable waste to use as mulch.

Source: wholeliving.com

Find new uses for old things

Image: naturalhomemagazine.com

- Repair (wobbly legs, missing knobs)
- Repaint (furniture)
- Reupholster (seats and couches)
- Rethink (doors for tables)
- Buy salvaged, secondhand, or antique furnishings, doors, trims, fixtures.
- Steer clear of single-pane windows, old toilets and used appliances (waste energy or water compared with newer models)

Recycle or donate unwanted items

1. Swapthing.com and **Freecycle.org** lets you trade something you don't need for something you do.

2. Newspaper classifieds and many weeklies have a "freebies" section where you can list furniture for the taking.

3. Consignment shops save time by letting someone else do the selling for you.

4. Craigslist.org and **KABOO.com** are free online sites where you can sell or give away unwanted items.

5. Charitable organizations and thrift stores such as the Goodwill, the Salvation Army, and Habitat for Humanity RESTOREs

7. Improve indoor air quality

Use healthy practices and materials

- Using entryway mats can reduce the amount of dust on carpets by 33%

- Homes where shoes are removed at the door have 10 times less dust than homes where shoes are worn.

- Use low- or zero-VOC interior paints and finishes.

- Use hard flooring instead of carpet (or use recycled carpet tiles).

- Decorate with plants.

Image: istockphoto.com/Elena Kalistratova

Source: USGBC 45 ways to green the not-so-green-house

Use green cleaning products

Source: wholeliving.com

- As many as 1/3 of Americans have an adverse reaction to common household chemicals.

Green Window Cleaner

- 1/2 teaspoon Castile or plant-based liquid soap
- 3 tablespoons distilled white vinegar
- 2 cups water

8. Landscape for Biodiversity

Reduce your lawn. Grow native plants

Source: wholeliving.com

Native Lawns and Plants

- Take a soil test to determine pH and nutrient availability.
- Select a diversity of plants adapted to site conditions.
- Select low maintenance cultivars and use proper maintenance to reduce unnecessary pesticide and fertilizer use.
- For lawns, recycle clippings, keep mower at 2 ½ inches, water early morning and de-thatch if thatch reaches more than ½ inch in thickness.
- Landscape to maximize energy efficiency for heating and cooling of home and surroundings.

9. Shop for Green Labels

Eco-Labels and Third-Party Certification

pharoslens.net

10. Learn More

Where can I learn more?

Green Home Resources

New Jersey

New Jersey Clean Energy Program http://njcep.com/
Rutgers Center for Green Building
www.greenbuilding.rutgers.edu

National

U.S. Green Building Council “The Green Home Guide”
http://www.greenhomeguide.org/
Green Building Advisor-Green Product Guide.
http://www.greenbuildingadvisor.com/product-guide

For More Information

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